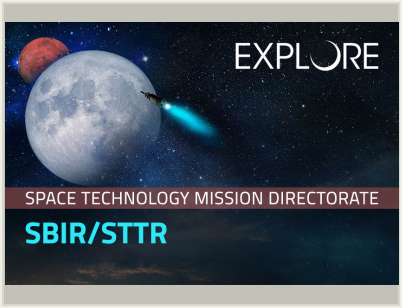
Adaptive autonomous Communications Routing Optimizer for Network Efficiency Management, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Maximizing network efficiency for NASA's Space Networking resources is a large, complex, distributed problem, requiring substantial collaboration. We propose the development of an innovative software tool that will support mission and scheduling personnel in developing, de-conflicting, optimizing, and maintaining space networks. We have developed an innovative networking and scheduling framework that facilitates the development of more intelligent and optimizing scheduling algorithms with a mixed-initiative architecture. This framework will be augmented to handle the complex and diverse constraints found in the space communications scheduling domain, allowing for accurate modeling. A mixed-initiative conflict resolution assistant will analyze the schedule, and suggest ways in which any conflicts might be resolved. Once a valid schedule has been produced, a multi-objective resource optimizer will refine the schedule to maximize mission satisfaction. Some of this technology has already been applied to the NASA Ground Network (space communications) scheduling and several domains including those involving similarly complex constraints, such as the problem of optimizing ballistic missile engagements, which includes complex line of sight (LOS) and range calculations between satellite-based sensors and three-dimensional ballistic missile trajectories. The ultimate goal of this proposed effort is to improve the space networking scheduling and execution capability. The goals of the Phase I research are to further understand the current and future space networking domain, including user interactions and collaboration, to investigate integration requirements, and to elaborate the heuristics, algorithms and techniques for improved space networking, and analyze them as to their feasibility. Other goals are to define the metrics for space networking performance, further prove the feasibility through prototype development, and develop the Phase II system design.



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Small Business Innovation Research/Small Business Tech Transfer

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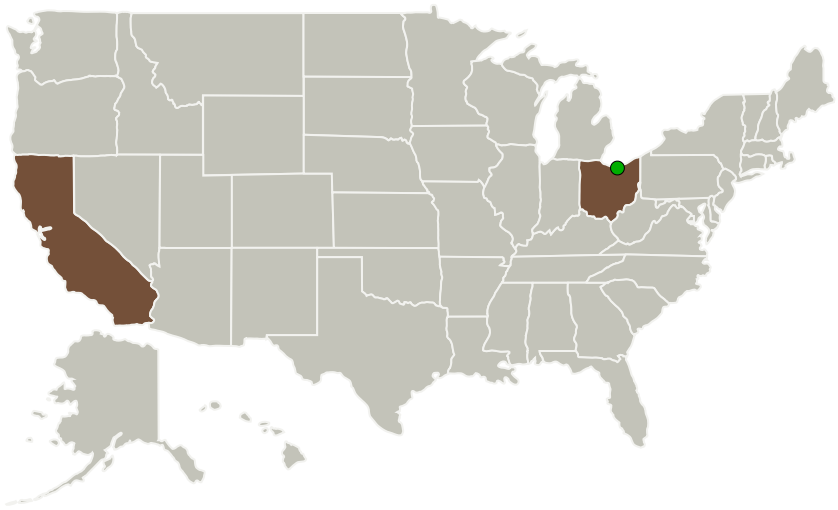
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Stottler Henke Associates, Inc.	Lead Organization	Industry	San Mateo, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137949)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Stottler Henke Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

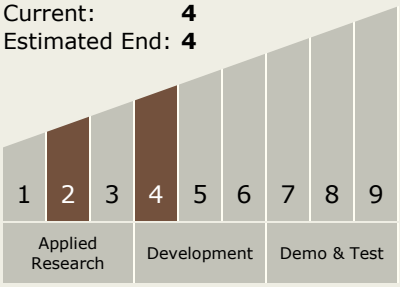
Carlos Torrez

Principal Investigator:

Robert Richards

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.3 Internetworking
    - TX05.3.2 Adaptive Network Topology

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System